

**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
(Chapter II of the Patent Cooperation Treaty)  
(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference P36034A/GWI/GMU	<b>FOR FURTHER ACTION</b>	See Form PCT/PEA/416
International application No. PCT/GB2004/005149	International filing date (day/month/year) 07.12.2004	Priority date (day/month/year) 20.12.2003
International Patent Classification (IPC) or national classification and IPC A42B3/06		
Applicant LLOYD (SCOTLAND) LIMITED		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
- a. ☒ sent to the applicant and to the International Bureau a total of 3 sheets, as follows:
- ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
- ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
- b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand  22.08.2005	Date of completion of this report  04.11.2005
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer  D'Souza, J  Telephone No. +31 70 340-4236  

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/005149

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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

**Description, Pages**

1-18 as originally filed

**Claims, Numbers**

5-16 received on 22.08.2005 with letter of 16.08.2005  
1-4 filed with telefax on 14.10.2005

**Drawings, Sheets**

1/4-4/4 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing *(specify):*
  - ☐ any table(s) related to sequence listing *(specify):*
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing *(specify):*
  - ☐ any table(s) related to sequence listing *(specify):*

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
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International application No.  
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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-16
	No: Claims	
Inventive step (IS)	Yes: Claims	1-16
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-16
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

Reference is made to the following document:

D1: US-A-3 829 900 (MARANGONI R) 20 August 1974 (1974-08-20)

**1 Claim 1 - Novelty (Article 33(2) PCT)**

- 1.1 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses (the references in parentheses applying to this document):

A body protecting device (1) for wearing by a user comprising:  
an outer surface and an inner surface; and  
an array of energy absorbing cells, wherein each cell comprises a tube (4),  
and wherein substantially each tube (4) has a side wall which is connected to  
the side wall of at least another tube substantially along the length of the tube  
(4),

- 1.2 The subject-matter of claim 1 therefore differs from this known device in that each tube has a tube axis extending from the outer surface towards the inner surface, such that the orientation of each tube is substantially maintained when a load is applied to the outer surface.

- 1.3 The subject matter of claim 1 is therefore novel (article 33(2) PCT).

**2 Claim 1 - Inventive step (Article 33(3) PCT)**

- 2.1 The problem to be solved by the present invention may be regarded as being to improve the performance of a body protecting device.

- 2.2 The solution to the problem proposed in claim 1 of the present application is

considered to involve an inventive step (Article 33(3) PCT), because in the available prior art it is neither known nor suggested to arrange the array of tubes such that the most favourable failure mode of progressive local buckling is maintained when a load is applied parallel to the axis of the tubes.

### **3 Dependent Claims**

Claims 2 - 16 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

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1     **CLAIMS**

2

3     1.    A body protecting device for wearing by a user  
4     comprising:

5            an outer surface; and

6            an array of energy absorbing cells,

7            wherein each cell comprises a tube,

8     and wherein substantially each tube has a side wall

9     which is connected to the side wall of at least

10    another tube substantially along the length of the

11    tube,

12           and wherein substantially each tube has a tube

13    axis arranged substantially normal to the outer

14    surface,

15           such that the orientation of each tube is

16    substantially maintained when a load is applied to

17    the outer surface.

18

19    2.    A body protecting device as claimed in Claim 1,

20    wherein the tube has a cylindrical or conical

21    structure.

22

23    3.    A body protecting device as claimed in Claim 1

24    or 2, wherein the body protecting device comprises a

25    safety helmet.

26

27    4.    A body protecting device as claimed in any

28    preceding claim, wherein substantially each tube has

29    a side wall which is connected to the side wall of

30    at least another tube by an adhesive.

31

1     5.    A body protecting device as claimed in any of  
2     Claims 1 to 3, wherein substantially each tube has a  
3     side wall which is welded or fused to the side wall  
4     of at least another tube.

5

6     6.    A body protecting device as claimed in Claim 5,  
7     wherein one or more tubes are formed from an inner  
8     core comprising a first material and an outer core  
9     comprising a second material.

10

11    7.    A body protecting device as claimed in Claim 6,  
12    wherein the second material has a lower melting  
13    temperature than the first material.

14

15    8.    A body protecting device as claimed in any  
16    preceding claim, wherein substantially each tube is  
17    connected to at least three other tubes.

18

19    9.    A body protecting device as claimed in any  
20    preceding claim, wherein substantially each tube is  
21    connected to six other tubes.

22

23    10.   A body protecting device as claimed in any  
24    preceding claim, wherein each tube has a diameter of  
25    between 2 and 8 mm.

26

27    11.   A body protecting device as claimed in any  
28    preceding claim, wherein each tube has a diameter of  
29    about 6 mm.

30

1 12. A body protecting device as claimed in any  
2 preceding claim, wherein the thickness of the side  
3 wall of each tube is less than 0.5 mm.

4  
5 13. A body protecting device as claimed in any  
6 preceding claim, wherein the thickness of the side  
7 wall of each tube is between 0.1 and 0.3 mm.

8  
9 14. A body protecting device as claimed in any  
10 preceding claim, wherein the length of each tube is  
11 less than 50 mm.

12  
13 15. A body protecting device as claimed in any  
14 preceding claim, wherein the length of each tube is  
15 between 30 and 40 mm.

16  
17 16. A body protecting device as claimed in any  
18 preceding claim, wherein the array of energy  
19 absorbing cells is provided as an integral material.

20  
21